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ANATOMY.

It is not too broad a statement to say that the modern methods of teaching anatomy reflect the general progress of that science during the past decade. In the limited time at my disposal I am only able to accentuate some of the main facts as they pertain to instruction in human anatomy. In this branch the revolution in the spirit and method of our teaching is primarily based on the recognition of man's scientific position in the vertebrate series. We have ceased, as teachers, to regard the human body as a thing apart and by itself, and the study of its structure and of the functions of its parts is no longer attempted without the aid which comparative anatomy and embryology so abundantly offer. The truths embodied in the doctrine of evolution have long furnished the quickening spirit of scientific morphological study and research, but their full utilization by the teacher of human anatomy as his most valuable guides is of so comparatively recent date that I feel justified in citing their pedagogic adoption as the most important and fundamental advance in late years in the methods of anatomical instruction.

It is so evident that every complete organism is only fully comprehended in all its relations when the method of its production and development is known, and the fact that the simplest conditions offer the logical starting point in learning or teaching complicated structural details is so in accord with our daily experience, that the disregard of phylogeny and embryology by teachers of human anatomy seems little short of incomprehensible. And yet in my own experience as a teacher of human anatomy I remember grave academic deliberations as to the propriety of placing the study on the scientific basis which we occupy to-day, and some doubtful queries as to whether after all it would not be more advisable to uphold the traditional method, somewhat as the Mos-

lem Kadis have continued to teach the Koran since the day of Mahomet. Human anatomy, considered from the standpoint of the instructor, has coursed through a curious cycle since Vesalius in the 14th century raised it to the dignity of a science.

From the point where he left it the knowledge of man's structure continued to develop during the succeeding centuries. The details of human gross anatomy were elaborated until every minute portion of the human frame received its complete description, and at least one more or less appropriate and lengthy name. The teaching of the science progressed along the same lines, and the increase in the details of descriptive anatomy found its response in the anatomical text-book. Edition succeeded edition, each containing somewhat more erudite and minute information than its predecessor, and this accumulated mass of facts confronted the student at the outset of his course. It is not remarkable that under these conditions the important fundamental structural lines of the subject were obscured and overshadowed by the quantity of detail, nor that the study of anatomy appeared to resolve itself into a more or less successful effort at memorizing the largest possible quantity of facts without special regard to their quality or importance.

I well remember in my own student days that every man with any pretensions to anatomical prowess could glibly and accurately describe the five surfaces of the orbital process of the palate bone and give their boundaries, but I doubt if many of us realized that said process was extremely lucky if it attained the size of a respectable pea, and a still smaller minority would have passed with credit through a practical demonstration on the skull. In the same way the knowledge that the artery of the vas deferens arises from the superior vesical was a never-failing source of satisfaction to

its possessor, while a student who faced west on Madison Square had no occasion to strain his descriptive faculties in the least in order to enumerate the Fifth Avenue Hotel in its correct position among the structures related to his common carotid artery. But the morphological connection and the mutual relation existing between prosencephalon and diencephalon, the principles governing the development and structure of the lung and vascular system, the disposition of the peritoneal membrane, and many like problems, were regarded in much the same light.

What knowledge of these structures the student obtained he gained in the most difficult manner, by a pure effort of memory. He had no constructive details at his command, no series of stages which, while demonstrating the road by which a complicated human structure reached its highest degree of development or regression, enabled him at the same time to grasp and hold the details of that structure as a permanent and lasting addition to his knowledge, not as facts memorized and hence to be forgotten. In this sense teaching by comparison and development marks our most important and fundamental advance in methods of instruction. That this advance will be progressive lies in the very essence of its character. We all recognize the practical importance of careful descriptive detail in teaching human anatomy. But in striving after the necessary accuracy and elaboration the minutiae should not be permitted to obscure and hide the broad morphological and functional principles which underlie the construction of the animal body.

They, after all, form the fundamental lines upon which the student must build his anatomical knowledge if the same is to be enduring, and these lines, if once firmly established, readily and logically permit the addition of the necessary details. The function of comparative anatomy and em-

bryology, as aids in the teaching of human anatomy, is to define clearly and demonstrate, beyond question or doubt, the cardinal morphological principles upon which the structure of the vertebrate body is reared. I can merely refer in passing to the development of the equipment necessary to the vitality and success of the method. Perhaps no other single fact accentuates the advances in morphological education more than the change which is to be observed in the spirit and purpose of the anatomical museum. It has ceased to be a storehouse for a heterogeneous association of curios, and has assumed its proper place as an important factor in scientific education, presenting the cardinal structural and functional principles of the vertebrate body in concrete serial form. From a collection it has become a library in which he who runs may read.

While we are justified in characterizing this fundamental change in the spirit and conception of anatomical instruction as our most pronounced methodical advance in recent years, a number of other improvements are entitled to your consideration. Hardly secondary in importance to the principle of the comparative and developmental method of teaching is the application of the principle in practice. I need not detain this audience with illustrative examples, which will suggest themselves, but I may be permitted to emphasize the fact that we have advanced materially in substituting true object-teaching for theoretical instruction. Perhaps nowhere more than in anatomy is lasting and valuable knowledge gained only by direct and personal examination of the object of the study.

Not only have our courses in practical anatomy increased in the time and material required and improved in the application of a thorough test by practical examination, but we have carried the same cardinal principle of sound anatomical instruction into

the details of the didactic course. It is probably true that, under proper conditions of environment, a parrot could be taught a hymn, for we have proof of his power in acquiring a secular vocabulary. In the same way, undoubtedly, a student can be taught a certain kind of anatomy by lecture, diagrams and models. But I question whether he will find this knowledge much more useful than the parrot his hymn. Assimilation of anatomical knowledge requires demonstration of the actual structures, to a limited number of students, for the purpose of enabling each to see and examine the objects themselves with which he is to become familiar, not models or diagrams. "I asked for bread and they gave me a stone"—or a model—is a saying which no student of anatomy should have occasion to apply to his own case.

This reason has led to the replacement of the didactic lecture by the section demonstration. I still concede to the lecture, modified and supplemented by demonstration, an important function in furnishing the orderly, logical and systematic presentation of the subject which is to serve as the guiding thread in the student's individual examination of the structures. It is the proper place for the elaboration of the broad morphological principles of vertebrate structure, but these should be illustrated and emphasized by the direct examination of the structures involved. The lecture should indicate clearly the main facts of which the student is to satisfy himself by personal observation in the demonstration. Both conducted side by side are mutual supplements.

Such, in brief, I conceive to be the main factors in the advance of anatomical teaching. Many secondary aids, such as the complete pedagogic separation of elementary and advanced students, the modern methods of preservation of material, the improved technique of preparations, the intro-

duction of elective and optional courses in general morphology and others would demand consideration if more time were at our disposal.

But, however brief and insufficient my presentation of the subject may appear, teachers of anatomical science feel that the advance along the lines indicated is a material gain and that, under the broad spirit of our universities, it will be progressive.

GEO. S. HUNTINGTON.

PHYSIOLOGY IN MEDICAL SCHOOLS.

THE paper which I have had the honor of preparing for this occasion consists of three parts; the first gives a critical review of the present unsatisfactory methods of teaching physiology in medical schools (in which institutions most of the physiological teaching is done); the second presents a detailed proposal for instruction in accordance with what are believed to be correct pedagogical principles; and the third discusses ways and means, and demonstrates that the proposed changes are within the present means of any successful school. The time allotted to each speaker requires the omission of the critical account of present methods and the discussion of ways and means. Only the second part of the paper can be given here.*

The picture I have drawn of the instruction in physiology in medical schools will not be challenged by teachers of that science. The sense that our methods of instruction neither develop nor much inform the mind is general. It is time that discussion of the difficulties and the way to remedy them should also be general. Physiology is the most highly developed rational discipline in medicine—not a merely descriptive science like anatomy and is well adapted to train the mind in scientific procedure, in the setting of problems for research, in the

*The full paper is printed in the *Boston Medical and Surgical Journal*, December 29, 1898.